

**IN THE CLAIMS:**

1 1-10. (Cancelled)

2 11. (Currently Amended) A method of dynamically controlling and managing oper-  
3 ating characteristics of a fuel cell system, including the steps of:

4 (A) providing a DC-DC converter circuit having an input connection to re-  
5 ceive the output of a fuel cell, and connected to place a load across the fuel cell, said DC-  
6 DC converter circuit having internal switches that are operated at a duty cycle that is ad-  
7 justable;

8 (B) providing a programmable controller that receives as an input, present and  
9 stored values of one or more operating characteristics, said programmable controller also  
10 being programmed to signal said DC-DC converter switches to adjust its duty cycle;

11 ~~(C) dynamically determining a desired value for one or more operating charac-~~  
12 ~~teristics of the fuel cell system, depending upon the operating conditions of the fuel cell~~  
13 ~~system, including determining a minimum fuel cell output voltage as said desired value;~~

14 ~~(D)~~ (C) identifying a weakest cell in a fuel cell ~~stack~~ stack;

15 ~~(E)~~ (D) measuring the output voltage of the weakest cell;

16 ~~(F)~~ (E) dynamically determining a desired value for said output voltage;

17 ~~(G)~~ (F) comparing a present value of said weakest cell output voltage with  
18 a desired value;

19 ~~(H)~~ (G) calculating a new duty cycle for the associated DC-DC converter  
20 within the fuel cell system required to substantially achieve said desired value for the  
21 output voltage of the weakest cell; and

22 ~~(I)~~ (H) signaling said DC-DC converter to adjust its duty cycle to said new  
23 duty cycle.

1 12-14. (Cancelled)

1 15. (Currently Amended)

2 A method of dynamically controlling and managing operating characteristics of a  
3 fuel cell system used to power a battery or an application device, including the steps of:

4 (A) providing a DC-DC converter circuit having an input connection to re-  
5 ceive the output of a fuel cell, and connected to place a load across the fuel cell, said DC-  
6 DC converter circuit having internal switches that are operated at a duty cycle that is ad-  
7 justable;

8 (B) providing a programmable controller that receives as an input, present and  
9 stored values of one or more operating characteristics, said programmable controller also  
10 being programmed to signal said DC-DC converter switches to adjust its duty cycle;

11 (C) dynamically determining a desired value for ~~one or more~~ a plurality of op-  
12 erating characteristics of the fuel cell system, depending upon the operating conditions of  
13 the fuel cell system;

14 (D) ~~measuring monitoring as said plurality of operating characteristic, the out-~~  
15 ~~put power of the fuel cell stack;~~

16 (E) dynamically determining ~~as said desired value,~~ an output power of the fuel  
17 cell stack that does not exceed a maximum power needed by at least one of the battery or  
18 the application device being powered by the system; but maintains said desired values of  
19 said operating characteristics;

20 (F) comparing a present value of said output power with a desired value;

21 (G) calculating a new duty cycle for the associated DC-DC converter within  
22 the fuel cell system required to substantially achieve said desired value for the output  
23 power; and

24 (H) signaling the DC-DC converter to adjust its duty cycle to said new duty  
25 cycle.

1 16. (Currently Amended) A method of controlling a fuel cell system, including the  
2 steps of:

3 (A) dynamically determining desired values for a plurality of operating char-  
4 acteristics being monitored in a current mode of operation of a fuel cell system;

- 5 (B) measuring each of said selected operating characteristics;
- 6 (C) determining a duty cycle required to substantially achieve each individual
- 7 desired value and storing each duty cycle;
- 8 (D) comparing stored values and selecting the minimum duty cycle; and
- 9 (E) using this duty cycle as the new duty cycle of the DC-DC converter circuit
- 10 switches within said fuel cell system;

1 17. (Previously Presented) The method as defined in claim 16 including the further  
2 step of:

- 3 periodically repeating determining the desired values and the measurements and
- 4 updating the duty cycle.

1 18. (Previously Presented) A method of measuring fuel cell concentration in a fuel cell  
2 system:

- 3 (A) identifying the weakest fuel cell in a fuel cell stack;
- 4 (B) increasing the overall stack output current and varying the duty cycle of
- 5 DC-DC converter circuit switches coupled to said fuel cell system until the voltage of the
- 6 weakest fuel cell approaches zero;
- 7 (C) measuring the stack output current as a limiting current;
- 8 (D) determining whether concentration is too high or too low, based on the
- 9 measured current value; and
- 10 (E) dosing additional fuel or water should a desired value not be met.

1 19. (Previously Presented) A method of dynamically controlling and managing tem-  
2 perature in a fuel cell system, including the steps of:

- 3 (A) measuring the stack output voltage of the fuel cell system;
- 4 (B) determining whether the stack output voltage is at a desired value depend-
- 5 ing upon the present desired temperature range of the fuel cell system, for the present op-
- 6 erating conditions, and

7 (C) adjusting the duty cycle of an associated DC-DC converter to change the  
8 output stack voltage to substantially the desired value.

1 20. (Currently Amended) A method of dynamically controlling the output power of a  
2 fuel cell system including the steps of:

3 (A) dynamically determining a desired value for the output power of the fuel  
4 cell system, depending upon the present operating conditions of the fuel cell system;

5 (B) measuring the output power of the fuel cell system;

6 (C) if the desired value is not substantially met, measuring fuel ~~cell~~-concentra-  
7 tion;

8 (D) adjusting fuel ~~cell~~-concentration to substantially achieve the desired value  
9 of the output power of the fuel cell system; and

10 (E) adjusting the overall stack voltage by adjusting a duty cycle of associated  
11 DC-DC converter circuit switches coupled to the fuel cell system to substantially achieve  
12 the maximum output power of the fuel cell system.